expressed in digits of the ternary scale of notation, every digit being either $-1, 0$, or $+1$. In this system, unity being, in multiplication, only an index, the rules for multiplication and division must consist entirely in directions for the management of the signs of unity; and it is on this principle that Mr. Fowler's machine is made to act. A short account is given of the principal parts of the machine, and of the mode in which they bring out the final results. It is necessary, however, in applying it to use, to have recourse to tables, both for converting the factors and reconverting the result; operations which introduce both labour and risk of error.

11. On the Minute Structure and Movements of Voluntary Muscles, in a letter addressed to R. B. Todd, M.D., F.R.S., &c. By William Bowman, Esq., Demonstrator of Anatomy in King's College, London, and Assistant Surgeon to King's College Hospital. Communicated by Dr. Todd.

The objects of the author, in this paper, are the following.—1st. To confirm, under some modifications, the view taken of the primitive fasciculi of voluntary muscles being composed of a solid bundle of fibrillæ. 2dly. To describe new parts entering into their composition: and 3dly. To detail new observations on the mechanism of voluntary motion.

He first shows that the primitive fasciculi are not cylindrical, but polygonal threads; their sides being more or less flattened where they are in contact with one another; he next records, in a tabular form, the results of his examination of their size in the different divisions of the animal kingdom. It appears that the largest are met with in fish; they are smaller in reptiles, and their size continues to diminish in insects, in mammalia, and lastly, in birds, where they are the smallest of all. In all these instances, however, an extensive range of size is observable, not only in different species, but in the same animal, and even in the same muscle. He then shows that all the fibrillæ into which a primitive fasciculus may be split, are marked by alternate dark and light points, and that fibrillæ of this description exist throughout the whole thickness of the fasciculus; that the apposition of the segments of contiguous fibrillæ, so marked, must form transverse striæ, and that such transverse striæ do in fact exist throughout the whole interior of the fasciculus. He next inquires into the form of the segments composing the fibrillæ, and shows that their longitudinal adhesion constitutes *fibrillæ*, and their lateral adhesion *discs*, or plates, transverse to the length of the fasciculus; each disc being, therefore, composed of a single segment from every one of the fibrillæ. He shows that these discs always exist quite as unequivocally as the fibrillæ, and gives several examples and figures of a natural cleavage of the fasciculus into such discs. It follows that the transverse striæ are the edges, or focal sections of these discs. Several varieties in the striæ are then detailed, and the fact noticed that in all animals there is frequently more or less diversity in the number of striæ in a given space, not only on contiguous fasciculi, but also on the same fasciculus at different parts.

The author then proceeds to describe a tubular membranaceous sheath, of the most exquisite delicacy and transparency, investing each fasciculus from end to end, and isolating it from all other parts; this sheath he terms *Sarcolemma*. Its existence and properties are shown by several modes of demonstration; and among others, by a specimen in which it is seen filled with parasitic worms (Trichinæ), which have removed all the fibrillæ. The adhesion of this sarcolemma to the outermost fibrillæ is explained.

It is also shown that there exist in all voluntary muscles a number of minute *corpuscles* of definite form, which appear to be identical with, or at least analogous to the nuclei of the cells from which the development of the fasciculi has originally proceeded. These are shown to be analogous to similar bodies in the muscles of organic life, and in other organic structures.

The author next describes his observations on the mode of union between tendon and muscle; that is, on the extremities of the primitive fasciculi. He shows that in fish and insects the tendinous fibrillæ become sometimes directly continuous with the extremities of the fasciculi, which are not taper, but have a perfect terminal disc. In other cases the extremities are shown to be obliquely truncated, where the fasciculi are attached to surfaces not at right angles to their direction.

Lastly. He states his opinion, and gives new facts on which it is founded, that in muscular contraction the discs of the fasciculi become approximated, flattened, and expanded; the fasciculi, of course, at the same time becoming shorter and thicker. He considers that in all contractions these phenomena occur; and he adduces arguments to show the improbability of the existence of any rugæ or zigzags as a condition of contracting fasciculi in the living body. The paper is abundantly illustrated by drawings of microscopic appearances.

The Society then adjourned over the long vacation, to meet again on the 19th of November next.